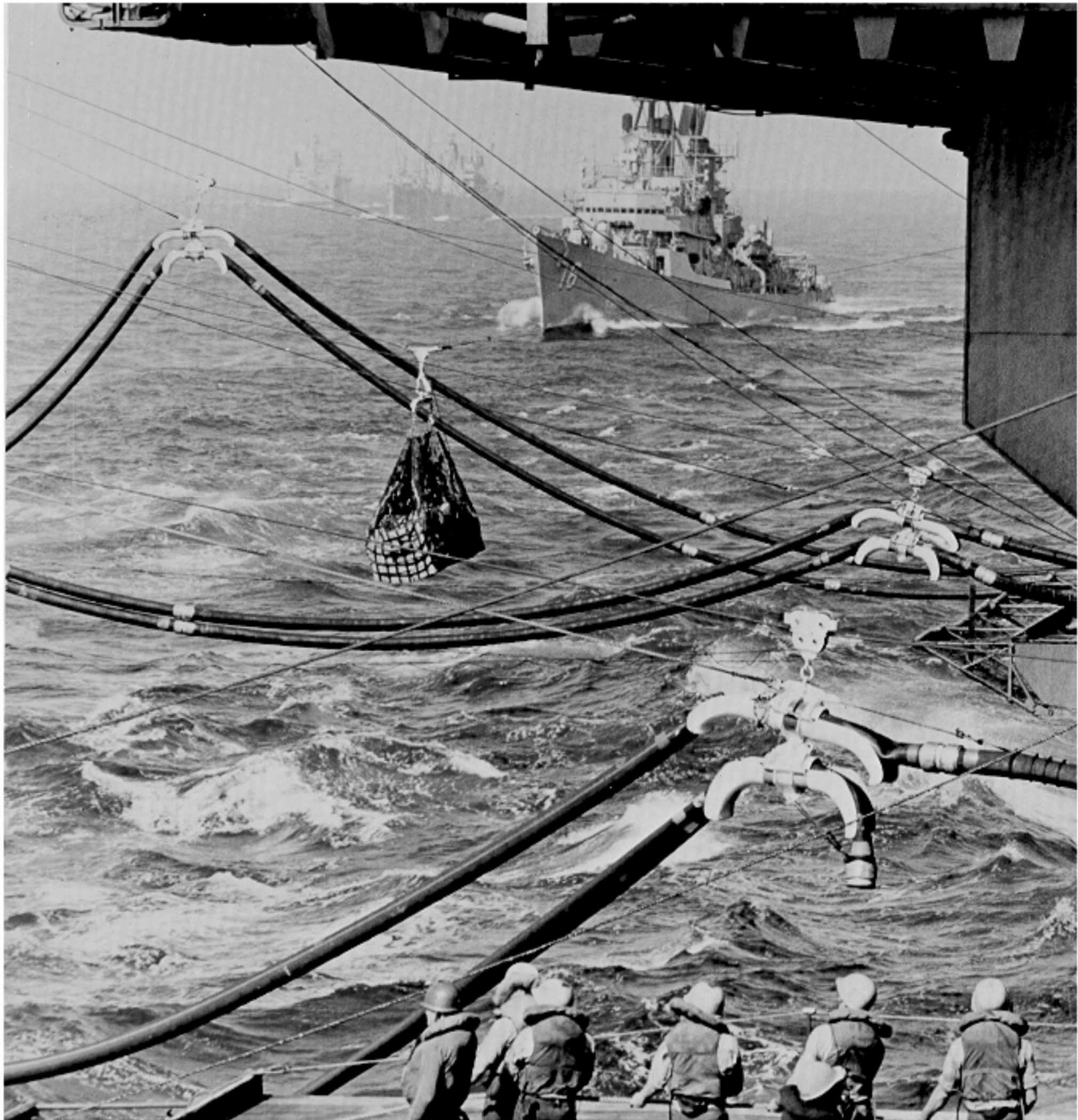


Ships designed for that purpose do most of the replenishment, but major combatant ships are capable of refueling smaller ships. Even the smallest ships can, and do, transfer light freight, mail, and personnel by means of highlines.

In addition to the standard replenishment capabilities, all recently constructed, as well as many of the older auxiliary, ships have helicopter platforms for the transfer of munitions, personnel, cargo, and stores by vertical replenishment. Vertical replenishment



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Figure 8-32.—Replenishment at sea enables the fleet to remain at sea and make successive strikes without returning to base for fuel, ammunition, and supplies.

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*Student Notes:*

permits a receiving ship to remain on station in combat formation, eliminating the necessity of temporarily immobilizing itself by going alongside another ship for replenishment.

**Ammunition Ships.**—Ammunition ships (AEs) (fig. 8-33) operate with replenishment groups to deliver ammunition and missiles to the fleet at sea. Their design incorporates a mechanical handling system for more rapid loading and off-loading of ammunition. The mechanical handling system includes such equipment as dual-cantilevered elevators in the holds; forklift trucks; and low-lift, power-operated transporters on the main deck for handling palletized ammunition from the elevators to the transfer stations. Universal portable metal dunnage provides maximum stowage with ready access to all types of ammunition. A tension highline system is built into the design along with new, improved electro-hydraulic cargo winches for replenishment at sea. These improvements provide for much more rapid and reliable transfers and conservation of deck space. These ships are capable of handling all types of missiles (fig. 8-34).

**Oilers and Tankers.**—Oilers (AOs), carrying Navy fuel oil, jet fuel, and other petroleum products, operate with replenishment groups and deliver their cargo to ships at sea. Oilers, as well as ammunition ships

(fig. 8-35), can service ships on both sides simultaneously.

The AO (Jumbo) is a conversion of the AO that includes the installation of a new midsection in the hull. This midsection increases the payload and provides for an improved balance of cargo fuel products to meet the more recent demands placed upon the AO by the increase in fleet requirements for jet aircraft fuel.

**Fast Combat Support Ships.**—The fast combat support ship (AOE) is the largest and most powerful auxiliary ship in the Navy. Unlike other replenishment ships, the AOE is designed to operate as an integral force rather than as a unit of an underway replenishment group.

The AOE (fig. 8-36) is a multiple-product ship (missiles, fuel, ammunition, and general cargo) that has a cargo-fuel capacity greater than that of our largest fleet oilers plus a hold capacity equal to the largest ammunition ship. In addition, the ship carries a large load of both general supplies, materials, and refrigerated cargo.

Other than speed and capacity, this ship has two major areas of improvement over other replenishment vessels—material handling and replenishment at sea. Materials, other than missiles and special weapons, are moved vertically by elevators or conveyors. Horizontal movement of general cargo and ammunition is



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Figure 8-33.—USS *John C. Stennis* (CVN 74) off-loads ammunition onto ammunition ship USS *Mount Hood* (AE 29).

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### *Student Notes:*



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Figure 8-34.—An AE highlines a missile to a guided-missile ship during replenishment at sea.

mechanized through the use of pallet transporters and forklift trucks. Cargo helicopters are available to replenish outlying units of the force with dry cargo and ammunition.

The missile and special weapons-handling system is separate from the cargo-handling system. This arrangement permits a continuous flow of missiles from the cargo holds to the missile-transfer system, port or starboard.

The fuel hoses on the AOE are designed to permit an average ship separation of 200 feet during

replenishment instead of the normal 100 feet. The greater distance reduces the possibility of collision and makes increased replenishment speeds feasible. There are nine replenishment stations to port and six to starboard.

**FLEET SUPPORT SHIPS.**—While certain types of naval auxiliary ships are designed and equipped specifically for towing, for salvage, or for rescue operations, most of these types may, in an emergency and to a limited extent, perform all these operations. Among ships as versatile and as adaptable as the

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***Student Notes:***





Figure 8-35.—AOE conducting an evolution.

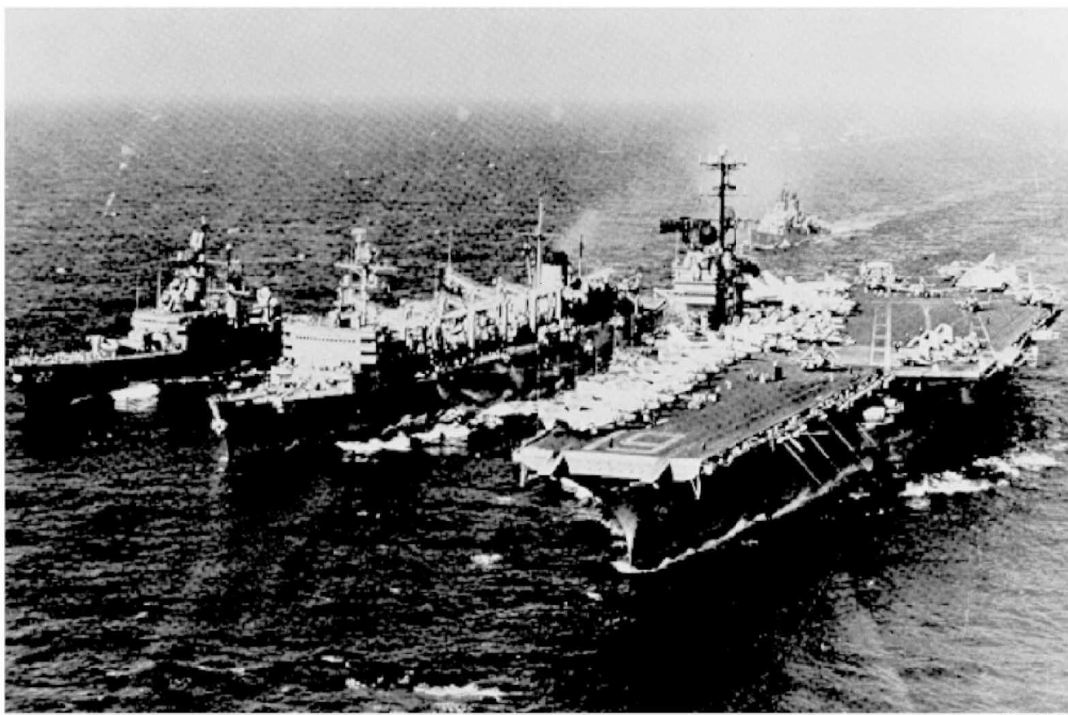


Figure 8-36.—A multiple-product AOE conducting under way replenishment.

auxiliaries, there is bound to be an occasional overlapping of functions to meet an unexpected situation.

**Rescue and Salvage Ships.**—The mission of the rescue and salvage ship (ARS) has four parts—debeaching stranded vessels, heavy lift capability from ocean depths, towing other vessels, and manned diving operations. For rescue missions, these ships are equipped with fire monitors forward and amidships, which can deliver either fire-fighting foam or seawater. The salvage holds of these ships are outfitted with portable equipment to provide assistance to other vessels in dewatering, patching, and supplying of electrical power and other essential services required to return a disabled ship to an operating condition.

The Navy employs ARSs (fig. 8-37) to salvage U.S. government-owned ships and, when it is in the best interests of the United States, privately owned vessels. The rugged construction of these steel-hulled ships, combined with speed and endurance, make rescue and salvage ships well suited for rescue/salvage operations of Navy and commercial shipping throughout the world. The versatility of this class of ship adds to the capabilities of the U.S. Navy with regard to assisting those in need on the high seas.

**Oceangoing Tugs.**—There is one major type of oceangoing tug—the ATF (fleet ocean tug) (fig. 8-38). It has a large cruising range and limited salvage capabilities. ATFs are equipped with firefighting equipment, including fire monitors. (A fire monitor is similar in appearance to a gun and permits water to be discharged through a horizontal arc of 360°.) They also are fitted with automatic towing machines and booms. In addition to hauling and towing, fleet tugs may be called on to patrol certain areas, lay smoke screens, and pull landing craft off beaches. They are often used in search and rescue (SAR) operations. Military Sealift Command (MSC) personnel now operate most fleet tugs.

### Combatant Craft

Combatant craft include patrol craft, amphibious warfare craft, and mine warfare craft.

**Patrol craft.** Surface patrol craft are intended for use relatively near the coast or in sheltered waters or



*Photograph courtesy of PH1 Todd P. Cichonowicz*

**Figure 8-37.—USS Grapple (ARS-53).**

rivers. These craft may be transported aboard larger units.

**Amphibious warfare craft.** All amphibious craft that have the organic capacity for amphibious assault, principally in coastal waters. They may be transported aboard larger units.

**Mine warfare craft.** All craft with the primary function of mine warfare that operate in coastal waters. They may be transported aboard larger units.

### Support Craft

Among the hardest working ships of the Navy are the support craft. Not primarily fighting ships, they are



*Photograph courtesy of Robert J. Sitar*

**Figure 8-38.—USNS Powhatan (T-ATF-166).**

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### Student Notes:

for the most part unarmed. These are ships that serve a variety of purposes in continental and overseas harbors, sea frontiers, convoys, amphibious forces, and task forces. Many are small, but of incalculable use to the Navy.

With a few exceptions, support craft designations start with the letter *Y*. A few of the class names identify the many duties they perform:

- Auxiliary floating dry dock—large (AFDB) and small (AFDL)
- Floating crane (YD)
- Diving tender (YDT)
- Ferryboat or launch (YFB)
- Fuel oil barge (YO)
- Gasoline barge (YOG)
- Oil storage barge (YOS)
- Floating workshop (YR)
- Tug (YTL, YTM, or YTB)
- Water barge (YW)

### REVIEW 5 QUESTIONS

- Q1. What is the term used to describe the transfer of fuel and supplies between ships while underway?
- Q2. Ships usually maintain a distance of \_\_\_\_\_ feet while taking on supplies at sea.
- Q3. What type of replenishment allows a receiving ship to stay on station in combat formation?
- Q4. What class of ship is the largest and most powerful auxiliary ship?

Q5. The mission of the rescue, salvage, and towing ships is to—

Q6. Support craft designators usually start with what letter?

## NAVAL AIRCRAFT

**Learning Objective:** When you finish this chapter, you will be able to—

- Recognize fixed-wing and rotary-wing aircraft, to include aircraft nomenclature and characteristics.

The history of naval aviation goes back to 1911 when the Navy acquired its first aircraft, a pusher-type biplane with no cockpit. The only covered surfaces were the wings and tail, and flight speed was less than 50 mph. By contrast, today's high-performance planes have speeds in excess of 2,000 mph.

### AIRCRAFT NOMENCLATURE

In this section, you will learn the basic parts of aircraft and how the Navy identifies aircraft.

#### Fixed-Wing Aircraft Nomenclature

A fixed-wing aircraft (fig. 8-39) may be divided into three basic parts—fuselage, wings, and empennage (tail).

**FUSELAGE.**—The fuselage is the main body of the aircraft, containing the cockpit and, if there is one, the cabin. On virtually all naval fighter and attack aircraft operational today, the engines and some of the fuel tanks are mounted within the fuselage.

**WINGS.**—Wings are the primary lifting devices of an aircraft, although some lift is derived from the fuselage and tail. Located on the trailing (rear) edge of the wings are flaps that may be used to give extra lift on

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### *Student Notes:*



takeoff or to slow the aircraft in flight or landings; ailerons that control the roll or bank of the aircraft; and trim tabs used to aerodynamically unload the control surfaces to relieve some of the pilot's work. On the leading (front) edge of the wing may be found auxiliary lifting devices, resembling flaps, which are used to increase camber (curvature) of the wing for added lift on takeoff. Most Navy jet aircraft carry their bomb loads on pylons (called *stations*) under the wings and, in some cases, under the fuselage. Some jets have missile stations on the sides of the fuselage. Fuel cells are located in the wings; additional external tanks can be fitted for extra range. Larger jets may have their engines slung beneath the wings in pods. Some low-wing aircraft have their main landing gear retract into the wings, while the nose wheel retracts into the fuselage. On most high-wing aircraft all gear retracts into the fuselage.

**EMPENNAGE.**—The empennage consists of the stabilizing fins mounted on the tail section of the fuselage. These include the vertical stabilizer on which is generally mounted the rudder that is used to control yaw, or direction of the nose about the vertical axis; and the horizontal stabilizer, on the trailing edge of which are the elevators that determine the pitch (climb or dive). Some supersonic aircraft may have a full delta wing. In that case, there is no horizontal stabilizer and the elevators and ailerons are combined into control surfaces called *elevons*.

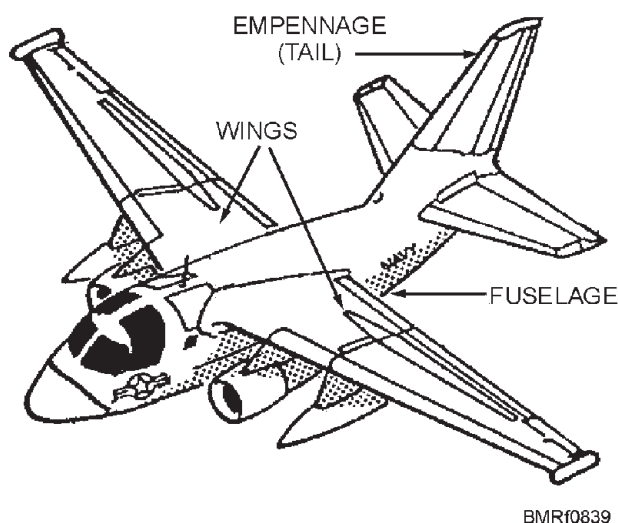


Figure 8-39. Fixed-wing aircraft.

In aircraft with internally mounted jet engines, exhausts normally are in the tail. High-performance jets have afterburners that give additional thrust at the cost of greatly increased fuel consumption.

Rudder, ailerons, and elevators are collectively grouped as control surfaces. The “stick” or a similar device in the cockpit controls these surfaces, while foot pedals control the rudder. On high-performance aircraft, aerodynamic pressures on these surfaces become too great for a pilot to overcome manually; hence, all high-speed models today have power-assisted controls.

### Rotary-Wing Aircraft Nomenclature

The aerodynamics of rotary-wing aircraft (fig. 8-40) are considerably more complex than those of fixed-wing aircraft. A helicopter essentially consists of a fuselage, main rotor or rotors, and often a tail rotor.

**FUSELAGE.**—As in fixed-wing aircraft, the fuselage contains the cockpit and cabin.

**MAIN ROTOR.**—The main rotor is the approximate equivalent of the wing of a fixed-wing aircraft. Each rotor blade is an airfoil, like a wing, and the lift is generated by the rotation of the assembly, which creates a flow of air over the blades.

A helicopter is lifted into the air by the aerodynamic forces on the rotor and not pushed up by the downwash. Some helicopters have twin rotors in tandem at either end of the fuselage; but most have a single, main rotor with a tail rotor mounted at right angles. A few have tandem intermeshing rotors.

**TAIL ROTOR.**—The tail rotor is used for directional control and stability. It is mounted at right angles to the main rotor to counteract the torque of that system. By varying the pitch of the tail rotor blades, the pilot controls yaw.

Helicopter engines are connected to the rotor shaft(s) by a transmission, which may be disengaged. That permits the engine(s) to be operated on the ground without engaging the rotor system and also permits a mode of flight known as *autorotation*. If the engines should stop while in flight, they can be disengaged; the freewheeling action of the rotor will allow a slower descent.

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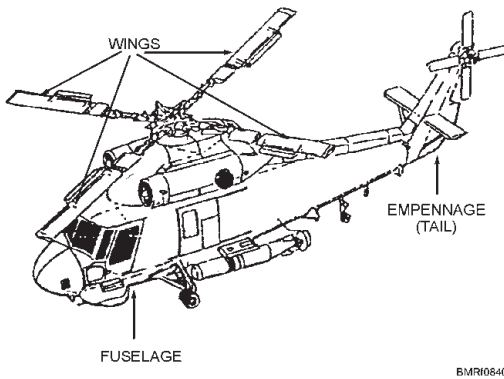


Figure 8-40.—Rotary-wing aircraft.

## AIRCRAFT MODEL DESIGNATIONS

All aircraft have tri-service designations; that is, a given aircraft has the same alphanumeric identification symbol, regardless of which service uses the aircraft. Look at table 8-2. Here, you can find the four basic parts of an aircraft model designation.

1. Mission/type modification symbol
2. Basic mission/type symbol
3. Aircraft series number
4. Model series letter

Now, let's try out this system of aircraft designation. For example:

### **EA-6B Prowler**

1. Find the letter "E" in the first column of the table. This aircraft has special electronics.
2. Find the letter "A" in the second column of the table. The basic mission symbol tells you that this is an attack aircraft.
3. The third column of the table explains the number after the dash. This is the sixth aircraft of this series.

Table 8-2.—Aircraft Model Designations

Mission/type modification symbol		Basic mission/type symbol		Aircraft series number	Model series letter
A	Attack	A	Attack	These numbers are assigned sequentially within each basic mission category. The number is separated from the basic mission symbol by a dash.	This letter, added to the series number, indicates an improvement or alteration of the basic mode. These are assigned in sequence; for example: F-4A, F-4B, F-4C, and so forth.
C	Cargo/transport	B	Bomber		
D	Drone control	C	Cargo/transport		
E	Special electronics	E	Special electronics		
H	Search and rescue	F	Fighter		
K	Tanker	H	Helicopter		
L	Cold weather operations	K	Tanker		
M	Missile capability	O	Observation		
O	Observation	P	Patrol		
Q	Drone	S	Antisubmarine		
R	Reconnaissance	T	Trainer		
S	Antisubmarine	U	Utility		
T	Trainer	V	Vertical takeoff and landing (VTOL)/short takeoff and landing (STOL)		
U	Utility	X	Research		
V	Staff transport				
W	Weather reconnaissance				



4. The fourth column explains the last letter of the aircraft designation. This is improvement/alteration B.

Let's try another one:

### **CH-46 *Sea Knight***

1. First letter is "C." This is a cargo aircraft.
2. Second letter is "H." This is a helicopter.
3. 46. This is the forty-sixth of the series.
4. No letter. There have been no improvements/alterations.

## **CURRENT FIXED-WING NAVY AIRCRAFT**

This section briefly describes some of the fixed-wing aircraft (fig. 8-41) currently operational within the Navy.

### **Attack Class**

Attack planes are used for low-level bombing, ground support, or nuclear strikes. They do not need the speed of fighters, but should be capable of heavy payloads, have good stability, and be able to carry enough fuel to remain on station long enough to render extended support to troops, if needed. Attack aircraft normally operate under conditions of good visibility, but some have the equipment needed for all-weather and night attacks.

**EA-6B PROWLER.**—The *Prowler* (fig. 8-42) is an all-weather tactical electronic warfare aircraft, based on the A-6 airframe. The *Prowler* provides jamming coverage to prevent missile engagement of U.S. or allied aircraft during strike operations. The *Prowler* also carries the high-speed antiradiation missile (HARM).

**AV-8B HARRIER.**—The *Harrier* (fig. 8-43) is the western world's only operational fixed-wing vertical short takeoff or landing (V/STOL) strike aircraft. It is an integrated V/STOL weapons system incorporating the inertial navigation and attack system (INAS) with an electronic display. The aircraft is used by the Marine Corps and is operated from the decks of aircraft carriers and amphibious support ships.

### **Fighter Class**

Fighters are high-performance aircraft generally employed to gain air superiority. They may be deployed defensively as interceptors, offensively as escorts for bombers or on ground support missions, or independently to counter enemy aircraft. Some are capable of carrying sufficient payloads for bombing missions.

**F-14 TOMCAT.**—The F-14 *Tomcat* (fig. 8-44) is an aircraft-carrier-based, jet-powered fighter aircraft. The aircraft is mainly missile oriented, carrying the new air-to-air missile, Phoenix, and capable of carrying the older Sidewinder and Sparrow. The *Tomcat* can be configured for bombing and rocketry.

**F/A-18 HORNET.**—The *Hornet* (fig. 8-45) is a sonic, single-seat, twin-engine jet. The fighter and attack versions are identical, except for selected interchangeable external equipment. Conversion from the fighter to attack mode (and vice versa) takes less than 1 hour. The aircraft is designed for aerodynamic agility, high reliability, high survivability, and reduced manpower maintenance requirements.

### **Patrol Class**

Patrol craft are land-based, long-range, multiengine aircraft used primarily for antisubmarine warfare (ASW) patrol. Patrol squadrons operate from the continental United States and overseas bases. The P-3 *Orion* is the Navy's primary ASW patrol aircraft.

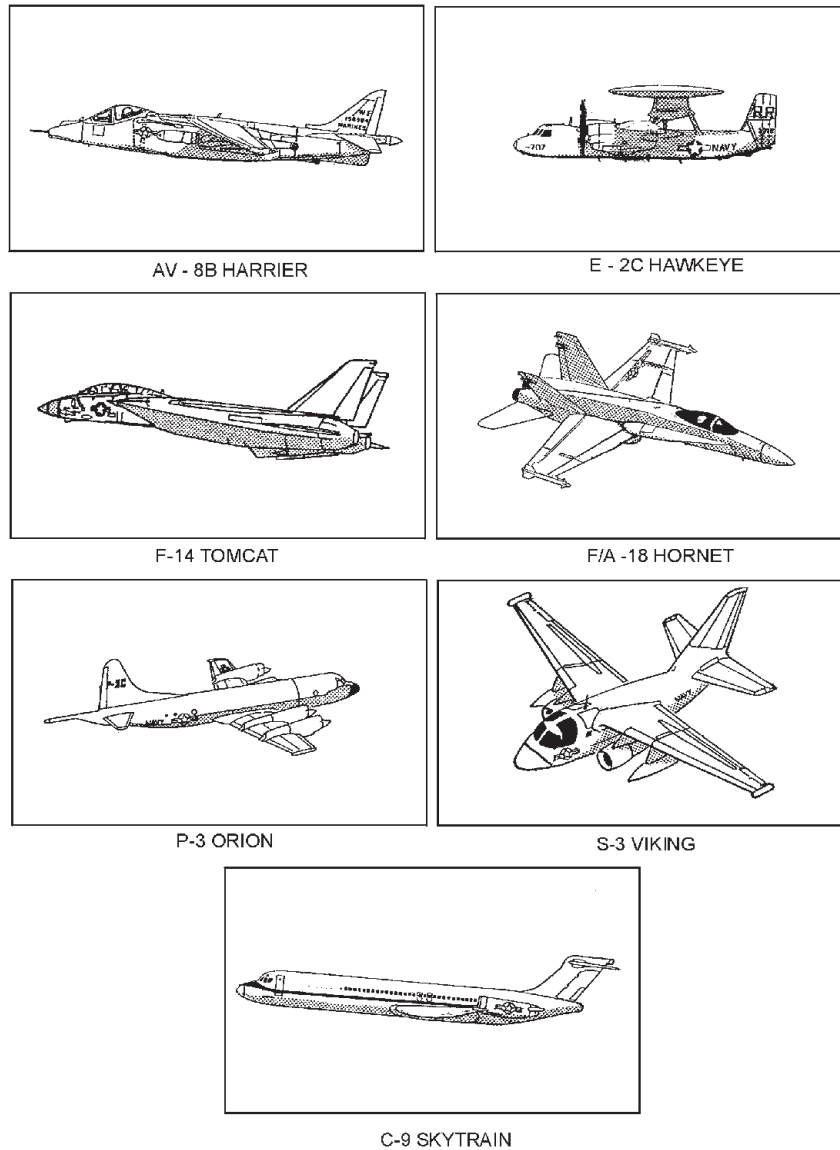
The P-3 *Orion* (fig 8-46) is equipped with magnetic anomaly detection (MAD) gear, sonobuoys, radar, and other submarine detection systems. It is armed with torpedoes, bombs, missiles, and depth charges for kills. It has the primary mission of detecting, locating, and destroying enemy submarines. The P-3 *Orion* can respond quickly to hunt down submarine contacts long before surface units can arrive. Other duties include convoy escort, photographic missions, and aerial mining.

### **Antisubmarine Class**

Antisubmarine aircraft operate from CVs in conjunction with hunter-killer group helicopters and

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## **Student Notes:**



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**Figure 8-41.—Representative of fixed-wing aircraft.**



*Photograph courtesy of Senior Airman Greg L. Davie*

**Figure 8-42.—EA-6B Prowler.**



*Photograph courtesy of PH3 Timothy C. Ward*

**Figure 8-43.—AV-8B Harrier lands and launches for deck qualifications on USS Constitution (CV 64).**



BMRf0844

Photograph courtesy of LCDR Mike Harrison

**Figure 8-44.—F-14 Tomcat.**



Photograph courtesy of Randy Hepp

**Figure 8-45.—F/A-18 Hornet.**

surface craft. The S-3 *Viking* is an example of such an aircraft.

The *Viking* (fig. 8-47) is a high-wing, jet-powered, twin-engine, carrier-based ASW aircraft. It carries surface and subsurface search equipment with integrated target-acquisition and sensor-coordinating systems that collect, interpret, and store ASW sensor data. It has direct attack capability with a variety of armaments.

### Warning Aircraft

Carrier-based airborne early warning (AEW) aircraft maintain station at some distance from a task force to provide early warning of approaching enemy aircraft and direct interceptors into attack position.

**E-2C HAWKEYE.**—The E-2C *Hawkeye* (fig. 8-48) has long-range antennas that are enclosed in a



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Photograph courtesy of PH2 Damon J. Mortiz

**Figure 8-46.—P-3 Orion.**

saucer-shaped, rotating disk atop the fuselage. The *Hawkeye* is manned by a crew of five.

**ES-3 SHADOW.**—The ES-3 *Shadow* (fig. 8-49) is a jet aircraft used to collect and disseminate tactical aircraft resembles the S-3 *Viking*, with the addition of numerous antennas and antenna housings. The ES-3 *Shadow* is a carrier-based, subsonic, all-weather, long-range, electronic reconnaissance aircraft. It operates primarily with carrier battle groups providing indications and warning support to the battle group and joint theater commanders. It carries an electronic sensors and communications gear.

**C-2A GREYHOUND.**—The C-2A *Greyhound* (fig. 8-50) is a twin-engine cargo aircraft, designed to land on aircraft carriers. The C-2A *Greyhound* provides logistics support to aircraft carriers. It's powered by two PT-6 turboprop engines and can deliver a payload of up to 10,000 pounds. The cabin can carry cargo,



Photograph courtesy of LCDR Mike Harrison

**Figure 8-47.—S-3 Viking refueling an F-14 Tomcat.**

### Student Notes:



passengers, or both. It's also equipped to accept litter patients in medical evacuation missions. Cargo such as jet engines can be transported from shore to ship in a matter of hours. A cage system or transport stand provides cargo restraint for loads during carrier launch or landing. The large aft cargo ramp and door and a



BMRf0848

Photograph courtesy of PH2 Damon J. Mortiz

**Figure 8-48.—E-2C Hawkeye waits for direction prior to flight operations on the USS Enterprise (CVN 65).**

powered winch allow straight-in rear cargo loading and downloading for fast turnaround. The C-2A's open-ramp flight capability allows airdrop of supplies and personnel from a carrier-launched aircraft. This, plus its folding wings and an on-board auxiliary power unit for engine starting and ground power



Photograph courtesy of LCDR Mike Harrison

**Figure 8-49.—ES-3 Shadow landing aboard USS George Washington (CVN 73).**

self-sufficiency in remote areas, provide an operational versatility found in no other cargo aircraft.

**C-2 SKYTRAIN.**—The C-9 *Skytrain* (fig. 8-51) fleet is located throughout the continental United States, Europe, and Asia. The Navy and Marine Corps C-9 aircraft provide cargo and passenger transportation as well as forward deployment logistics support. The Air Force C-9s are used for medical evacuation, passenger transportation, and special missions. The C-9 *Skytrain* is the military version of the McDonnell Douglas DC-9 used for many years by commercial airlines.

**C-12 HURON.**—The C-12 *Huron* is a twin-engine logistics aircraft that carries passengers and cargo between military installations. The C-12F provides logistics support between Navy air stations. It's powered by two PT-6A-42 turboprop engines and can deliver a total payload of up to 4,215 pounds. The cabin can carry cargo, passengers, or both. It is also equipped to accept litter patients in medical evacuation missions.

**C-130 HERCULES.**—The C-130 *Hercules* (fig. 8-52) is a four-engine turboprop aircraft. It's the workhorse of the military services, capable of landing and taking off from short, rough dirt runways. It's a



Photograph courtesy of Larry Smith

**Figure 8-50.—C-2A Greyhound landing aboard USS John F. Kennedy (CV 67).**

people and cargo hauler that's used in a wide variety of other roles, such as gunships, weather watchers, tankers, firefighters and aerial ambulances. There are more than 40 versions of the *Hercules*, and it is widely used by more than 50 nations.

**T-45A GOSHAWK.**—The T-45A *Goshawk* (fig. 8-53) is a tandem-seat, carrier capable, jet trainer. The

## Student Notes:



Photograph courtesy of Senior Airman Delia Castillo  
**Figure 8-51.—C-2 Skytrain.**

T-45A aircraft is used for intermediate and advanced portions of the Navy/Marine Corps pilot training program for jet carrier aviation and tactical strike missions. There are two versions of T-45 aircraft currently in operational use at this time.

- The T-45A has an analog design cockpit.
- The T-45C is built around a new digital “glass cockpit” design.

**T-34C TURBOMENTOR.**—The T-34C *Turbomentor* is an unpressurized two-seat, tandem cockpit low-wing turboprop trainer. The T-34C is used



Photograph courtesy of SGT David W. Richards  
**Figure 8-52.—C-130 Hercules.**

to provide primary flight training for student pilots attached to the Chief of Naval Air Training. As a secondary mission, approximately 10 percent of the aircraft provide pilot proficiency and other aircraft support services.

## **CURRENT ROTARY-WING NAVY AIRCRAFT**

Since World War II, the helicopter has become an indispensable part of naval warfare. Its applications seem limitless—ASW; pilot rescue; transfer of supplies, mail, and personnel within dispersed forces; amphibious warfare; evacuation of wounded; counterinsurgency; minesweeping; and others. Figure 8-54 shows representative types of rotary-wing aircraft.

### **CH-46 Sea Knight**

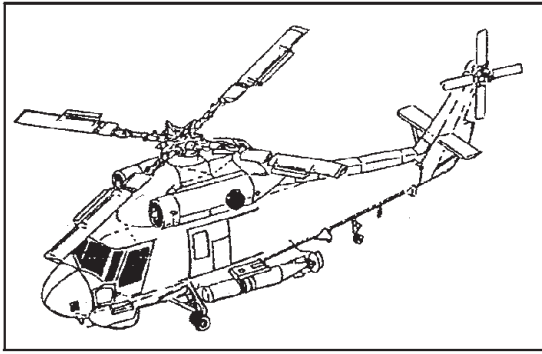
The *Sea Knight* (fig. 8-55) is a twin-turbine transport helicopter that provides the fleet with a



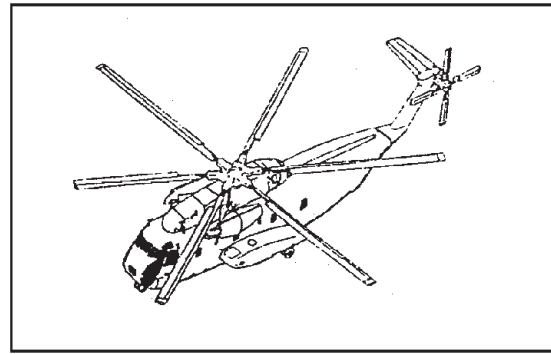
Photograph courtesy of Bob Lawson, USN (Ret)  
**Figure 8-53.—T-45A Goshawk.**

day/night underway replenishment capability. It is used primarily for supply missions at sea and for casualty evacuation. Its carrying capacity is 25 troops, 15 litters and attendants, or 4,000 pounds of cargo. Rotor blades fold for shipboard use. The CH-46 is a small version of the Army’s *Chinook*.

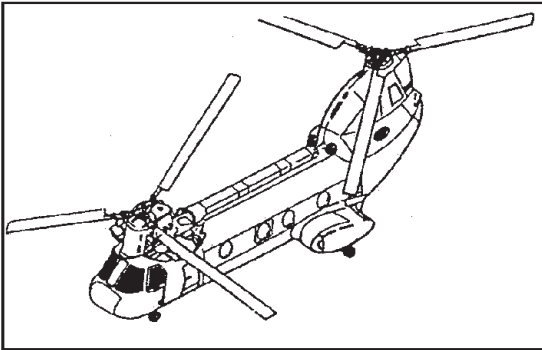
## **Student Notes:**



SH - 2F SEASPRITE

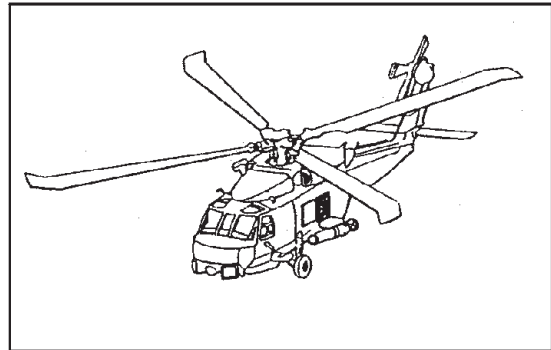


CH -53D SEA STALLION



CH - 46 SEA KNIGHT

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SH - 60B SEA HAWK

Figure 8-54.—Representative types of rotary-wing aircraft.

### SH-2 *Seasprite*

The *Seasprite* (fig. 8-56), an ex-utility helicopter, is now serving in the LAMPS (light airborne multipurpose system) program with the destroyer Navy.

### CH-53D *Sea Stallion*

The *Sea Stallion* (fig 8-57) tows and operates various mine countermeasure devices designed to detect and neutralize submerged naval mines. CH-53D squadrons are capable of rapid worldwide deployment.

### SH-60B *Seahawk*

The *Seahawk* SH-60B (fig. 8-58) is placed aboard frigates and destroyers. The *Seahawk* is the airborne platform segment of the LAMPS Mk III weapons system. It can carry personnel as well as weapons to detect, localize, and destroy submarines at long range. It is designed to be in constant voice and data link contact with the ship's CIC. In addition to its primary mission of



Photograph courtesy of PHAN Mahaya Jordan

Figure 8-55.—CH-45 *Sea Knight* transports ordnance from flight deck of the USS *Independence* (CV 62).

### *Student Notes:*





Photograph courtesy of PH2(NAC) Jeff Viano

**Figure 8-56.—SH-2 Seasprite**

seeking and engaging submarines many miles from the ship, the *Seahawk* helicopter is able to provide targeting information for over-the-horizon, surface-to-surface missiles. The secondary mission of the *Seahawk* helicopter is search and rescue, medical evacuation, vertical replenishment, and communications relay.

### **MH-53E Sea Dragon**

The MH-53E (fig. 8-59) is used primarily for airborne mine countermeasures, with a secondary mission of shipboard delivery. The MH-53E *Sea Dragon* is heavier and has a greater fuel capacity than its



Photograph courtesy of SSGT D.W. Mobley

**Figure 8-57.—CH-53D Sea Stallion airlifts grain for Somalia.**

ancestor, the CH-53E *Super Stallion*. MH-53s can operate from carriers and other warships. The *Sea Dragon* is capable of carrying up to 55 troops or a 16-ton payload 50 nautical miles or a 10-ton payload 500 nautical miles. The MH-53E is capable of towing a variety of mine-sweeping countermeasures systems, including the Mk 105 minesweeping sled, the ASQ-14 side-scan sonar, and the Mk 103 mechanical mine-sweeping system.

### **V-22A Osprey**

The V-22 *Osprey* is a joint-service, multimission aircraft with vertical take-off and landing (VTOL) capability. It performs VTOL missions as effectively as



Photograph courtesy of PH3 Anthony Haley

**Figure 8-58.—SH-60B Seahawk aboard USS Carney (DDG 64) during VERTREP.**

a conventional helicopter while also having the long-range cruise abilities of a twin turboprop aircraft. The Marine Corps is the lead service in the development of the *Osprey*. The Marine Corps version, the MV-22A, will be an assault transport for troops, equipment and supplies, and will be capable of operating from ships or from expeditionary airfields ashore. The Navy's HV-22A will provide combat search and rescue, delivery and retrieval of special warfare teams along with fleet logistic support transport. The Air Force CV-22A will conduct long-range special operations missions.

### **Student Notes:**



**Figure 8-59.—MH-53E *Sea Dragon*.**

The *Osprey* is a tiltrotor aircraft with a 38-foot rotor system and engine/transmission nacelle mounted on each wing tip. It can operate as a helicopter when taking off and landing vertically. Once airborne, the nacelles

rotate 90 degrees for horizontal flight, converting the V-22 to a high-speed, fuel-efficient turboprop airplane. The wing rotates for compact storage aboard ship. The first flight occurred in March 1989. The V-22 is the world's first production tiltrotor aircraft. Planned purchases include 360 for the Marine Corps, 48 for the Navy, and 50 for the Air Force.

### **TH-57 *Sea Ranger***

The TH-57 *Sea Ranger* is a derivative of the commercial Bell Jet Ranger 206. Although primarily used for training, these aircraft are also used for photo, chase, and utility missions. The Jet Ranger was initially designed to compete in a U.S. Army light observation helicopter competition. Bell lost that competition; but, the 206 was commercially successful. The TH-57 Sea Ranger provides advanced (IFR) training to several hundred aviation students a year at Naval Air Station Whiting Field in Milton, Florida.

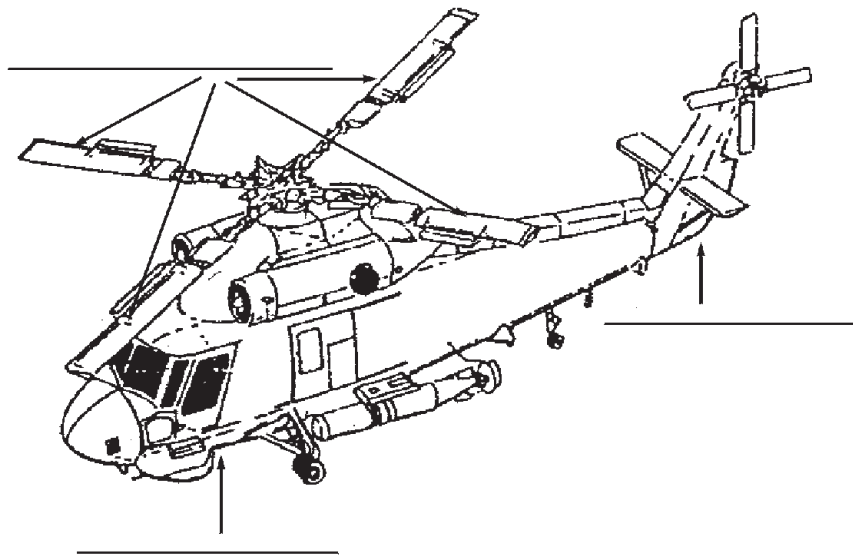
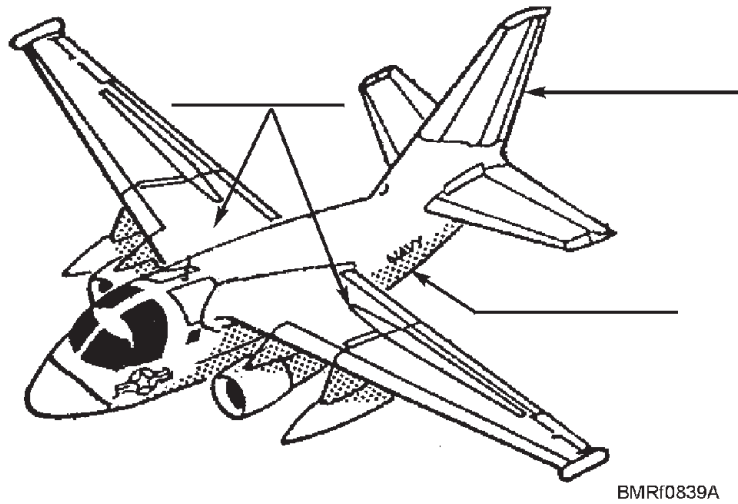
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### ***Student Notes:***

## REVIEW 6 QUESTIONS

Q1. When did the Navy acquire its first aircraft?

Q2. Label the three basic parts of a fixed-wing aircraft.



Q3. Label the three basic parts of a rotary-wing aircraft.

Q4. All aircraft have what type of designation?

Q5. Identify the following aircraft.

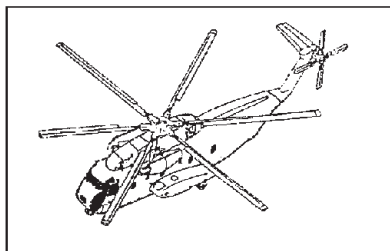
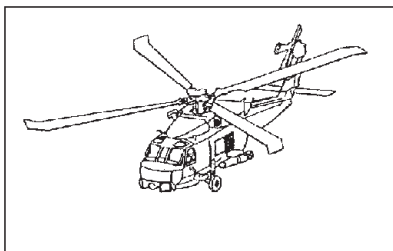
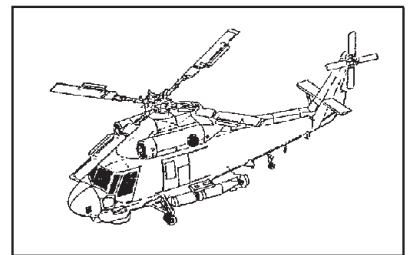
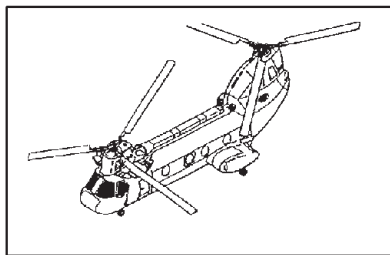
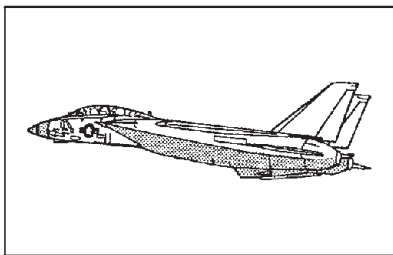
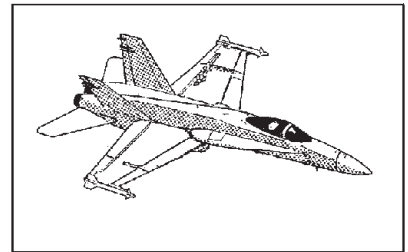
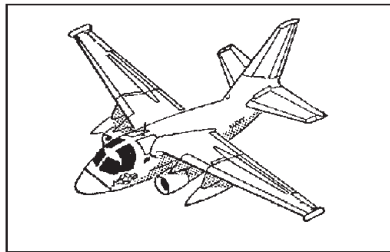
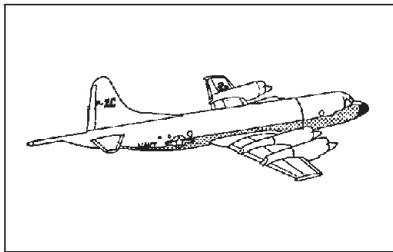
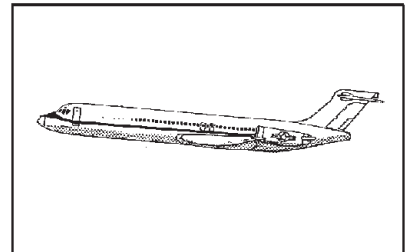
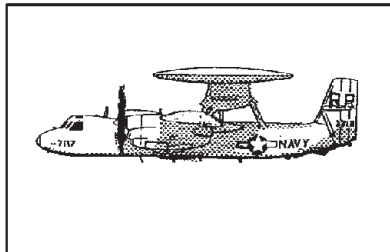
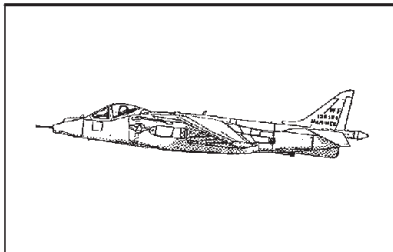


## SUMMARY

In today's world, the United States requires military power adequate to strengthen national security objectives. The United States Navy is an integral component of this nation's military forces. Freedom of the seas is not a gift; it must be won through naval presence or engagements. Naval forces provide our

nation with the ability to provide a significant presence in crisis areas, or, if required, a rapid offensive capability.

The U.S. Navy has the ability to control enemy naval forces in three areas—air, surface, and subsurface. It can also conduct amphibious and mine warfare operations.



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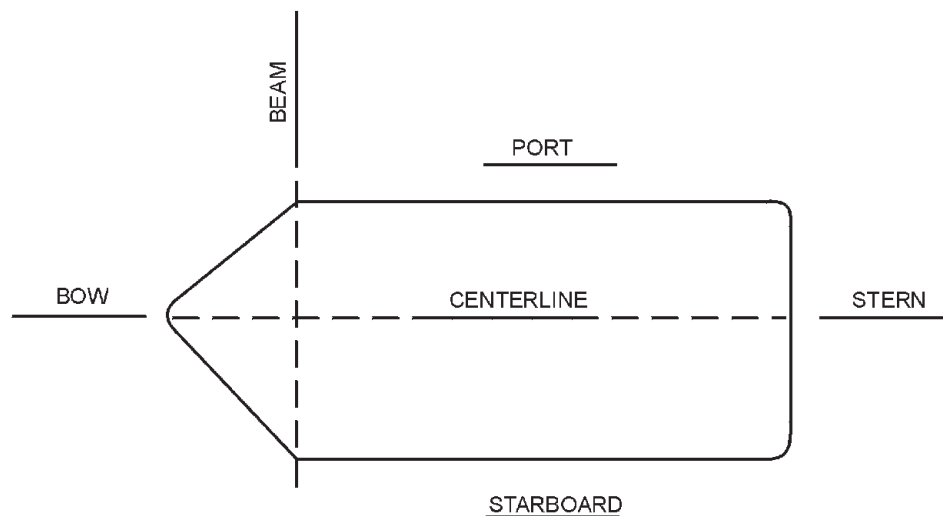
*Student Notes:*

One of the most important aspects of naval warfare is the ability to provide supply and support operations. With the Navy's wide range of underway replenishment and supply ships, we can keep U.S. Navy battle groups under way in crisis areas for long periods of time. The most recent example of this ability is the Persian Gulf War. Today's Navy consists of a new generation of cruisers, destroyers, fighter and strike aircraft, high-speed amphibious assault ships, mine countermeasures ships, replenishment ships, submarines, and weapons

systems. With these craft, vessels, and weapons systems, our nation employs the most modern and capable naval force in existence.

### REVIEW 1 ANSWERS

A1. Ship's parts are labeled as shown.

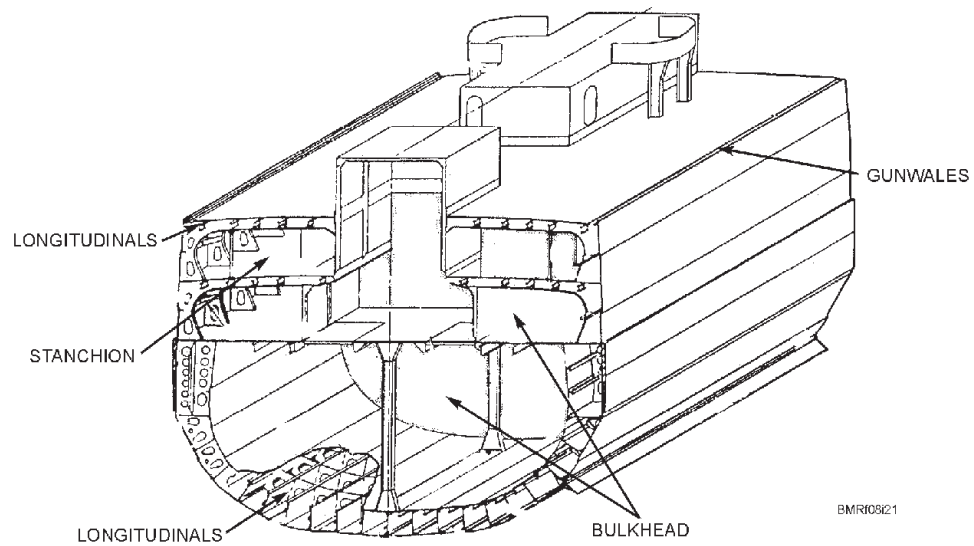


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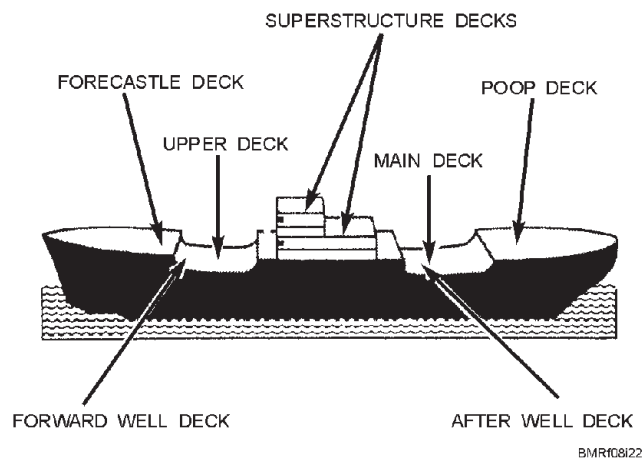
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***Student Notes:***

A2. Some of the areas of a ship are labeled as shown.



A3. Some of the decks of a ship are labeled as shown.

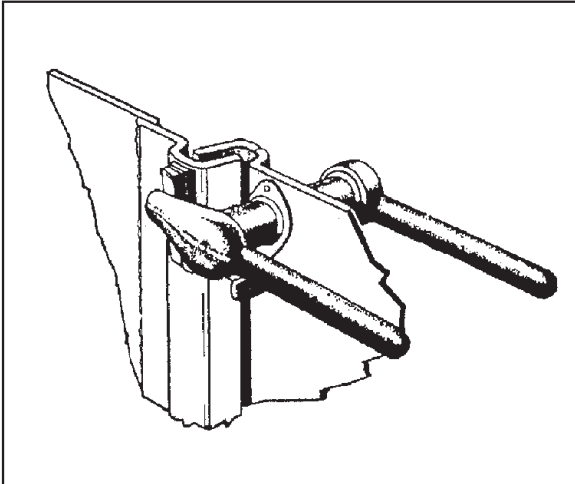


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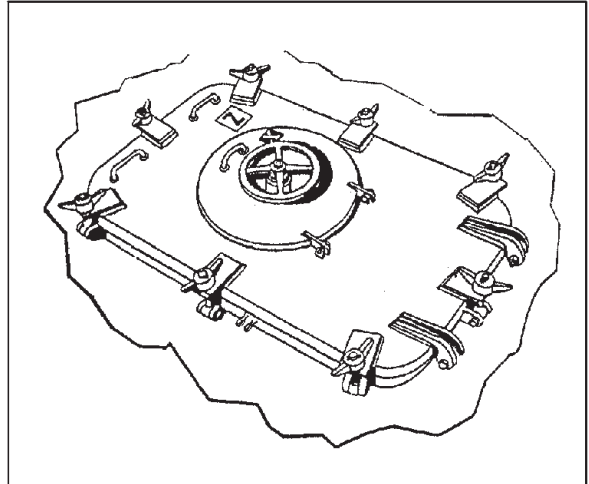
***Student Notes:***



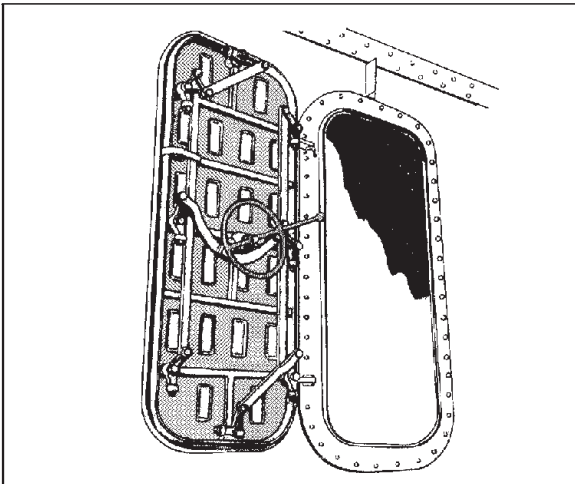
A4. Doors and hatches.



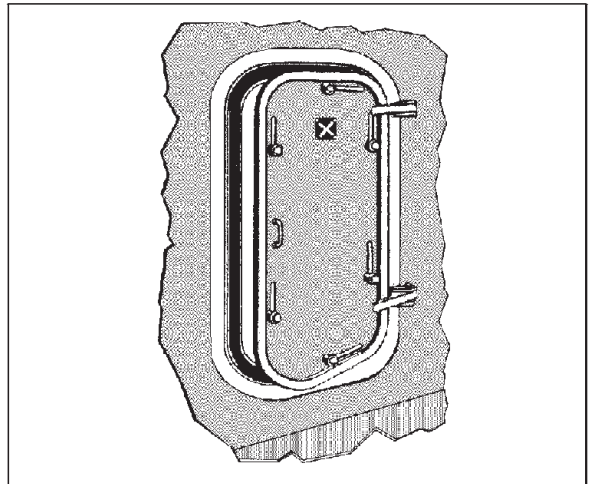
DOGS AND GASKET FOR WATERTIGHT DOOR



BOLTED HATCH WITH ESCAPE SCUTTLE



QUICK-ACTING WATERTIGHT DOOR



WATERTIGHT DOOR WITH INDIVIDUALLY OPERATED DOGS

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**REVIEW 2 ANSWERS**

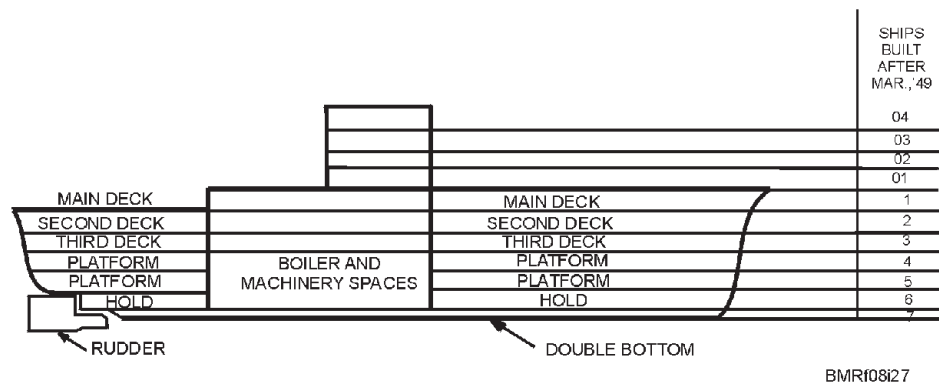
A1. Compartment designation number 01-56-2-Q is identified as follows:

- 01— **Main deck**
- 56— **Frame number**
- 2— **First compartment on the portside**
- Q— **Miscellaneous or office space**

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*Student Notes:*

A2. The following spaces of a ship are shown.



### REVIEW 3 ANSWERS

- A1. The size of a ship is usually given as **displacement in long tons**.
- A2. A ship's armor is **the protective armor along the sides of the ship, on the deck, and on some gun mounts and turrets**.
- A3. The term used to indicate the speed of a ship is the **knot, which is 1 nautical mile per hour or about 1 1/8 statute miles per hour**.

### REVIEW 4 ANSWERS

- A1. The four categories of ships are—
- Auxiliary ships**
  - Combatant craft**
  - Combatant ships**
  - Support craft**
- A2. The categories of warships include—
- Aircraft carriers**
  - Battleships**
  - Cruisers**
  - Destroyers**
  - Frigates**
  - Submarines**
- A3. The battleships are named after **states**.
- A4. The two basic classes of cruisers are—
- Guided-missile cruisers (CG)**
  - Guided-missile cruisers nuclear (CGN)**
- A5. For protection, the destroyer depends on its **speed and mobility**.
- A6. The class of ship developed for the purpose of open ocean escort and patrol was the **frigates**.
- A7. The two classes of submarines are the—
- Attack submarine**, and the
  - Ballistic missile submarine**
- A8. The class of ship used to land large numbers of personnel, equipment, and supplies on enemy held territory is the **amphibious war ship**.

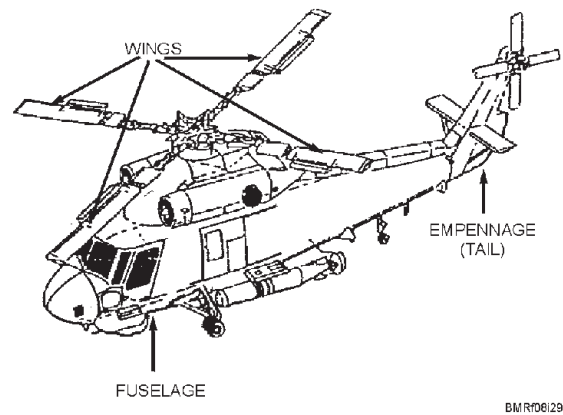
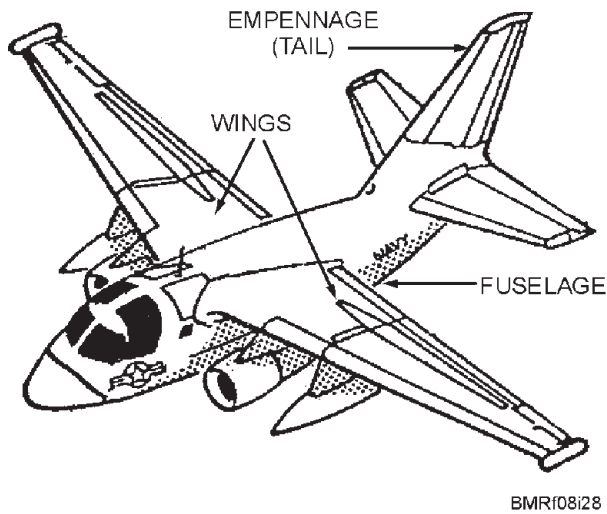
### *Student Notes:*

## REVIEW 5 ANSWERS

- A1. The term used to describe the transfer of fuel and supplies between ships while under way is **replenishment at sea**.
- A2. Usually, ships maintain a distance of **100 feet** while taking on supplies at sea.
- A3. A receiving ship can stay on station in combat formation while undergoing **vertical replenishment**.
- A4. The largest and most powerful auxiliary ship is the **fast combat support ship (AOE)**.
- A5. Rescue, salvage, and towing ships provide **rapid firefighting, dewatering, battle damage repair, and rescue towing assistance**.
- A6. Support craft designators usually start with the letter **Y**.

## REVIEW 6 ANSWERS

- A1. The Navy acquired its first aircraft in **1911**.
- A2. The three basic parts of a fixed-wing aircraft are shown below.
- A3. The three basic parts of a rotary-wing aircraft are shown below

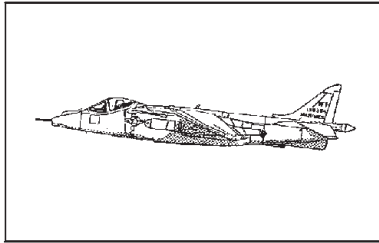


- A4. All aircraft have **tri-service designations**.

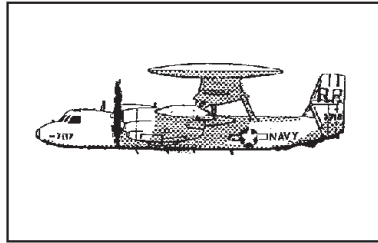
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*Student Notes:*

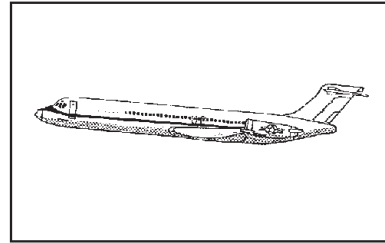
A5. Aircraft identification.



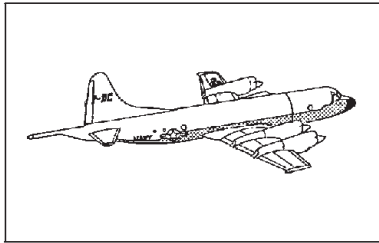
AV-8B HARRIER



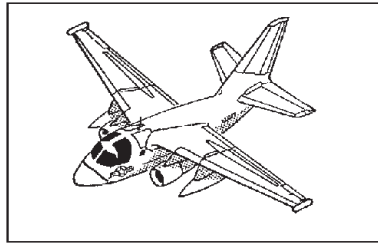
E-2C HAWKEYE



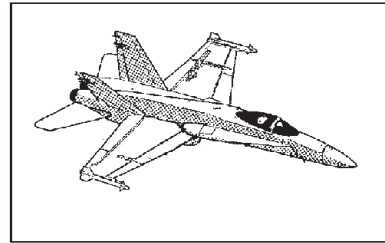
C-9 SKYTRAIN



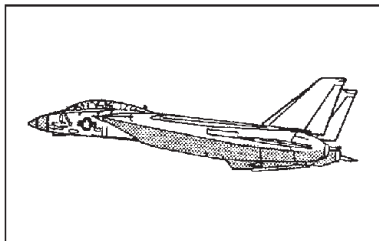
P-3 ORION



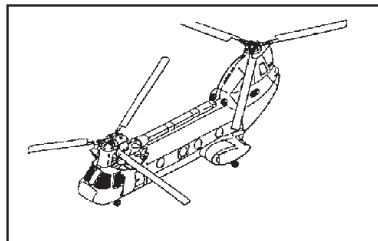
S-3 VIKING



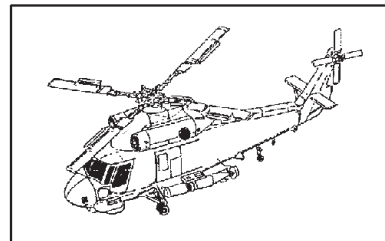
F/A-18 HORNET



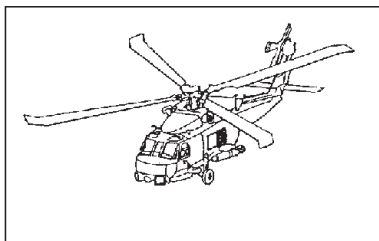
F-14 TOMCAT



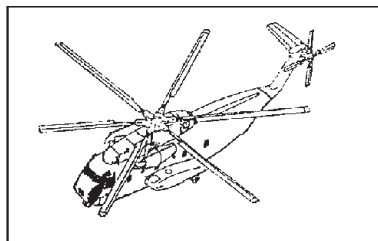
CH-46 SEA KNIGHT



SH-2F SEASPRITE



SH-60B SEA HAWK



CH-53D SEA STALLION

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*Student Notes:*



# CHAPTER COMPREHENSIVE TEST

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1. Which of the following structural components is the backbone of a ship?
  1. Stringer
  2. Prow
  3. Stem
  4. Keel
2. Which of the following structural components divides the interior of a ship into compartments?
  1. Longitudinals
  2. Bulkheads
  3. Strakes
  4. Gunwales
3. Which of the following structural components form the ship's hull?
  1. Longitudinals
  2. Bulkheads
  3. Strakes
  4. Gunwales
4. The vertical distance from the bottom of the keel to the waterline of the ship is identified by what nautical term?
  1. Freeboard
  2. Strake
  3. Draft
  4. Void
5. Which of the following structural components support decks?
  1. Athwartships deck beams
  2. Fore-and-aft deck girders
  3. Stanchions
  4. All of the above
6. The freeing ports that let water run off during heavy weather are identified by which of the following terms?
  1. Companionways
  2. Bulwarks
  3. Scuppers
  4. Flats
7. Which of the following terms defines the first complete deck below the main deck?
  1. First deck
  2. Second deck
  3. Third deck
  4. Fourth deck
8. The device that bears up tight on wedges and holds watertight doors closed is identified by which of the following terms?
  1. Dogs
  2. Scuttle
  3. Coamings
  4. Belaying pins
9. Which of the following terms defines the horizontal openings for access through decks?
  1. Hatches
  2. Doors
  3. Manholes
  4. Scuttles
10. Which of the following terms defines the solid part of a ship above the main deck?
  1. Superstructure
  2. Upper deck
  3. Forecastle
11. Which of the following is a type of mast?
  1. Mizzenmast
  2. Mainmast
  3. Foremast
  4. All of the above
12. What is the purpose of running rigging?
  1. For stays and shroud support
  2. To support stacks
  3. To hoist, lower, or control booms or boats
  4. To support the mast
13. Commissioned ships of the U.S. Navy fly a commission pennant that is secured to what point?
  1. The forecastle
  2. Aft of the fantail
  3. To a pigstick and hoisted to a truck
  4. Level adjacent to the bridge

14. What term identifies the port and starboard halves of a yard?
  1. Yardarms
  2. Pigstick
  3. Gaff
  4. Peak
15. The national ensign is flown from what part of a ship when it is anchored or moored?
  1. Jackstaff
  2. Flagstaff
  3. Pigstick
  4. Peak
16. What is the additional ship control space used by the squadron commander or admiral called?
  1. Signal bridge
  2. Main control
  3. Flag bridge
  4. Bridge wind
17. In what part of a ship is main control normally located?
  1. Chart house
  2. Secondary conn
  3. Combat information center
  4. Boiler or machinery spaces
18. Ships of the U.S. Navy are divided into how many categories?
  1. One
  2. Two
  3. Three
  4. Four
19. How many types of ships are included in the warship category?
  1. Five
  2. Six
  3. Seven
  4. Eight
20. What type of ship is the center of a modern naval task force or task group?
  1. Aircraft carrier
  2. Destroyer
  3. Cruiser
  4. Submarine
21. Approximately how many aircraft are embarked on Nimitz class CVs?
  1. 70
  2. 75
  3. 80
  4. 85
22. What class of cruiser is designated as battle force capable?
  1. Ticonderoga
  2. Spruance
  3. Arleigh Burke
23. Which of the following is a principle mission of a destroyer?
  1. Operate offensively against submarines and surface ships
  2. Operate defensively against submarines and surface ships
  3. Both 1 and 2 above
  4. Operate short-range attack against all aircraft
24. What class destroyer represents a return to all-steel construction?
  1. Kidd class
  2. Spruance class
  3. Arleigh Burke class
25. Which of the following is the mission of frigates?
  1. Protective screens
  2. Open ocean escort and patrol
  3. Defensive operations against surface ships
  4. Offensive operations against subsurface ships
26. What class of submarines has the quietest operation?
  1. Sturgeon
  2. Ohio
  3. Seawolf
27. The Ohio class ballistic submarine has how many Trident missile tubes?
  1. 16
  2. 20
  3. 24
  4. 26

28. The LHA carries what means of defense against surface and air attack?
1. 5-inch guns only
  2. Mk 38 machine guns only
  3. 5-inch guns and Mk 38 machine guns
29. How many troops can be embarked in, transported by, and landed by the Wasp class LHDs?
1. 1,500
  2. 2,000
  3. 2,500
  4. 3,000
30. What is the purpose of dock landing ships?
1. To transport amphibious craft only
  2. To transport vehicles only
  3. To transport troops only
  4. To transport a variety of amphibious craft and vehicles with embarked crews and troops
31. Which of the following means is/are used by Avenger class MCMs to find, classify, and destroy moored and bottom mines?
1. Sonar and video systems
  2. Cable cutters
  3. A mine-detonating device
  4. Each of the above

IN ANSWERING QUESTIONS 32 THROUGH 35, SELECT THE TYPE OF AUXILIARY SHIP DEFINED BY THE QUESTION.

32. An ammunition supply ship.
1. AOE
  2. ASR
  3. AE
  4. AO
33. Deliver fuel, oil, jet fuel, and other petroleum products.
1. AOE
  2. ASR
  3. AE
  4. AD
34. Supply dry and refrigerated stores.
1. AOE
  2. ASR
  3. AE
  4. AO
35. Combat support ship
1. AOE
  2. ASR
  3. AE
  4. AO
36. Which of the following terms applies to the transfer of fuel, munitions, supplies, and personnel from one vessel to another while ships are under way?
1. Vertical replenishment
  2. Horizontal replenishment
  3. Replenishment at sea
  4. Replenishment while under way
37. A separation of what approximate distance is maintained between the replenishment ship and the ship it's replenishing?
1. 50 feet
  2. 75 feet
  3. 100 feet
  4. 125 feet
38. The AOE is designed to operate at what approximate distance between itself and the ship it's replenishing?
1. 150 feet
  2. 175 feet
  3. 200 feet
  4. 225 feet
39. Most fleet tugs are operated by which of the following organizations?
1. U.S. Navy
  2. U.S. Coast Guard
  3. Army Corps of Engineers
  4. Military Sealift Command
40. Combatant craft usually operate in what areas?
1. In open waters
  2. In coastal waters
  3. In intercontinental waters
  4. In the deep sea

41. Support craft designations start with what letter?
1. S
  2. T
  3. Y
  4. Z
42. Fixed-wing aircraft are divided into how many basic parts?
1. One
  2. Two
  3. Three
  4. Four
43. What is the primary lifting device of an aircraft?
1. Tail
  2. Wings
  3. Ailerons
  4. Fuselage
44. What are the three main parts of a helicopter?
1. Tail, rotors, and empennage
  2. Tail, rotors, and fuselage
  3. Main rotor, fuselage, and tail rotor
  4. Main rotor, empennage, and tail rotor
45. Attack class planes are used in which of the following roles?
1. Nuclear strikes
  2. Ground support
  3. Low-level bombing
  4. Each of the above
46. What class of aircraft is generally used to gain air superiority?
1. Attack
  2. Fighter
  3. Patrol
  4. Warning
47. The E-2C *Hawkeye* belongs to what class of aircraft?
1. Patrol
  2. Warning
  3. Antisubmarine
  4. Fighter
48. The S-3 *Viking* belongs to what class of aircraft?
1. Patrol
  2. Warning
  3. Antisubmarine
  4. Fighter
49. What helicopter is designated for ASW use?
1. CH-46 *Sea Knight*
  2. SH-2 *Seasprite*
  3. SH-60B *Seahawk*
50. What helicopter operates and tows mine countermeasures devices?
1. CH-46 *Sea Knight*
  2. SH-60B *Seahawk*
  3. CH-53D *Sea Stallion*